THE DUNCAN PROJECT
SUMMARY REPORT

Province of British Columbia
Ministry of Agriculture, Fisheries and Food

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John Vielvoye, P.Ag.
Provincial Grape Industry Specialist
B.C. Ministry of Agriculture, Fisheries & Food

and

Brent Warner, P.Ag.
New Crop Specialist
B.C. Ministry of Agriculture, Fisheries & Food

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Special recognition is given to Mr. & Mrs. Dennis Zanatta and family for providing a site, labour, tractor and materials to establish the vineyard, and assisting in data collection and vineyard maintenance.

Funding for the project came from - Mr. Zanatta; The BCMAFF'S D.A.T.E. program (Demonstration of Agriculture Technology and Economics); and regional ministry budgets to support staff.

British Columbia Ministry of Agriculture, Fisheries and Food staff planned the vineyard, planted, trained, trellised, sprayed, pruned, harvested, repaired the vineyard trellis when needed, and maintained the weather station. Staff also designed the irrigation system, designed and installed the deer fence, and attempted to construct a bird control net with support system.

Several additional experiments to control crown gall and powdery mildew, and to increase fresh fruit cluster size and berry size, were also conducted (with appropriate special use permits). Sincere gratitude is expressed to all concerned, especially to Brent Warner, Dick Keepence, Delia Warnock, Doug O'Brien, Peter Fofonoff, Mark Turner, Eric Schulz, Tony Kluge, the late Gavan Anderson and George Carter. B.C. Ministry of Environment staff provided the weather station, repaired equipment and provided printouts of climate data collected at the site. Sincere gratitude is expressed to everyone involved.

Plant material for the project was donated or obtained from other co-operative BCMAFF trial plantings in the Okanagan; Gray Monk Estate Winery; private grape nurseries; Mr. John Harper, (who also provided considerable moral support and discussion of project activities); and Mr. Lyall Denby (retired) at Agriculture Canada Research Station, Summerland.

The wine making program at Agriculture Canada Research Station, Summerland, under the direction at the time of Mr. Gary Strachan (retired), produced and provided wines for assessments. Assessments of wine at Duncan was greatly assisted and facilitated by the organizational skills and personal contacts of Mr. Austin Fraser.

Special recognition is also given to Mrs. Nona Bennett for her long hours and patience in preparing the typed report, and to Ms. Sally Abbott for her assistance in editing.

Introduction

A project to determine if wine and fresh market grapes could be produced successfully in the maritime climates of British Columbia began in 1983 at Duncan in the Cowichan Valley on Vancouver Island. This project was initiated after numerous requests were received by B.C. Ministry of Agriculture, Fisheries and Food staff for information about the possibility of growing grapes commercially in the cool coastal climate of Vancouver Island and the Fraser Valley. Also instrumental in initiation of the project was a tour organized in 1981 by the B.C. Land Commission, which drew attention to the need to determine the general suitability of tree fruit and small fruit production, specifically on Class 4 & 5 soils with topography, stoniness and moisture limitations.

Available climate and soil survey information appeared to indicate that parts of Vancouver Island were suitable for commercial production of fresh market and wine grapes. Some small scale production has existed in these areas for many years, but there has been no observation of these plantings or historical research of the grape performance. Most of these vineyards are planted to old fresh market varieties and/or late maturing wine grapes.

Sovereign Charter - Blue seedless fresh market grapes.

Project Location

The project was carried out on approximately one acre of private land belonging to the Zanatta family in the Glenora district, just outside the city of Duncan.

1983-1986

	LAST DAY OF SPRING FROST	FIRST DAY OF FALL FROST	FROST FREE DAYS	MIN. TEMP.	MAX. TEMP.	TOTAL HEAT UNITS (C^o)	(APR-OCT) TOTAL PRECIPITATION
1983	Apr. 14, -0.2	Oct. 29, -0.9	198	Dec. 26, -15.0	July 30, 30.0	979.15	320.8 mm
1984	Apr. 27, -1.1	Oct. 14, -0.7	169	Dec. 31, - 8.0	July 24, 34.1	733.35	412.0 mm
1985	Apr. 30, -1.0	Oct. 8, -1.0	160	Dec. 1, -17.0	July 19, 34.6	901.3	314.0 mm
1986	Apr. 29, -1.0	Oct. 23, -0.1	176	Feb. 19, -11.5	Aug. 27, 34.8	862.95	249.5 mm
1987	Apr. 18, -1.0	Oct. 15, -0.2	179	Dec. 24, -5.3	Aug. 31, 35.2	1013.8	140.1 mm
1988	Apr. 8, -1.5	Oct. 27, -1.4	201	Jan.3, -7.7 Feb. 1 7.7	July 19, 38.9	1026.6	not recorded
1989	Apr. 9, -0.6	Oct. 15, -0.8	188	Feb. 4, -15.9	June 3, 4, 30.7	934.9	no longer recorded
1990	Apr. 6, -0.1	Oct. 19, -0.1	195	Feb. 18 -9.0	Aug. 11, 32.0	761.9	no longer recorded
AVERAGE	**Apr. 17**	**Oct. 18**	**183**	**-11.3**	**33.8**	**901.7**	

Climate and Soils

Climate and soils are the two most important natural resources influencing grape production. These resources are interrelated, with climate playing a leading role in the relationship.

The soils at the project site are described as Qualicum in the Ministry of Environment's Technical Report 15 - "Soils of Southeast Vancouver Island, Duncan-Nanaimo Area". These are soils that are rapidly drained and do not have a water table within three feet of the surface. Qualicum soils have very gravelly loam sand textures. They are classified in the soil survey as marginal to unsuitable for agriculture because they have low water holding capacity and they are low in nutrients. Urban uses are often recommended for these coarse soils because they are well suited for septic tank effluent disposal. These soils are not suitable for dryland hay production or ground crops because they are too dry during the summer months. However they are well suited to grape and tree fruit production when irrigation is used to supplement natural rainfall, and fertilizer is used to improve soil fertility.

Climate data for the project site was not available. The closest site for which data was available was located at the Duncan Forestry Station approximately 10 km away, at an elevation approximately 150 meters lower than the project site. Climate data was recorded at the project site for the period 1983-1990. A Stevenson screen containing a maximum and minimum thermometer and 30 day recording thermograph was installed, along with automatic and manual recording rain gauges. Recording of rainfall proved to be difficult and was discontinued.

Minimum Winter Temperatures (Degrees Celcius) 1983-1989

YEAR	DATE	TEMP.	YEAR	DATE	TEMP.
1983	Dec. 20	-10.2	1987	Dec. 22	-1.2
	" 21	-13.3		" 23	-5.1
	" 22	-14.4		" 24	-5.3
	" 23	-15.1		" 25	-2.9
1984	Jan. 15	-6.0	1988	Jan. 3	-8.0
	" 16	-6.0		Feb. 1	-8.0
	" 17	-7.5			
	" 18	-9.0			
	" 19	-6.9			
	" 20	-6.6			
1985	Nov 22	-12.3	1989	Feb. 1	-12.0
	" 23	-14.4		" 2	-12.3
	" 24	-12.7		" 3	-11.1
	" 25	-10.8		" 4	-15.9
	" 26	-15.9		" 5	-12.0
	" 27	-10.5		" 6	-10.0
	" 28	-13.2			
	" 30	-12.7			
	Dec. 1	-17.0			
1986	Feb. 18	-6.8	1990	Feb. 17	-5.4
	" 19	-11.5		" 18	-9.0
	" 20	-10.8		" 19	-8.6
	" 21	-8.3			

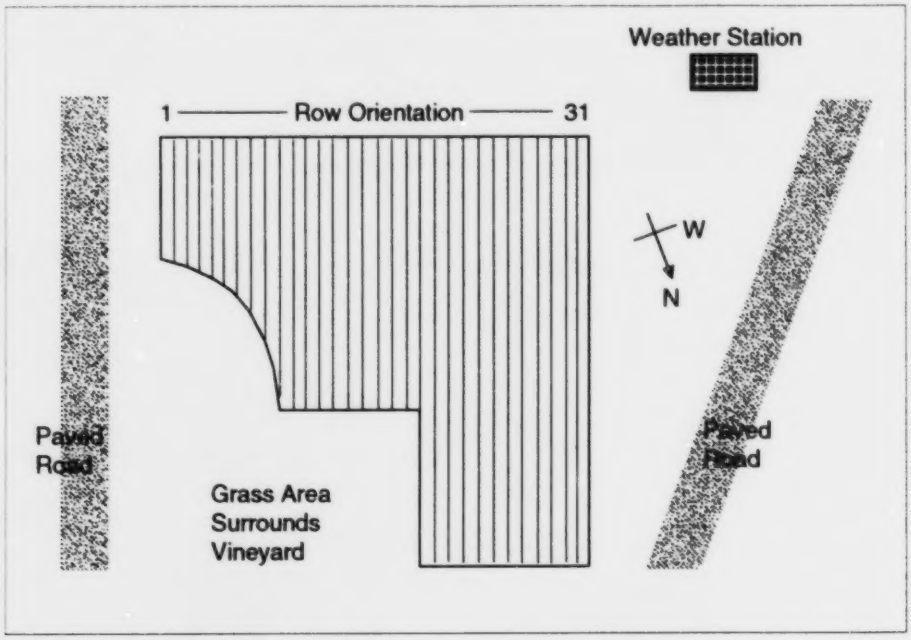
Vineyard Layout, Spacing, Trellising

All rows were laid out in a north to south direction. Four different trellis designs were used, necessitating two different row spacings. The first 16 rows of the project were trained to a standard vertical trellis system using a pendelbogen (European loop) training system with four catch wires. A portion of each row trained this way was converted to a bi-lateral cordon and was spur pruned.

Rows 17 and 18 were trellised to a standard Kniffen system to accommodate fresh market varieties. Row 19 was trained to a Silvos system to accommodate the drooping growth habit of Castel 19637. Rows 20 to 31 were devoted to the Summerland V system. This system permitted the use of a divided canopy.

The first 16 rows were spaced at 2.7 meters (9 feet), vines were spaced at 1.5 meters (5 feet). Rows 17-31 were spaced at 3 meters (10 feet) with vines spaced at 2.1 meters (7 feet).

Duncan Project Vineyard Layout



Soil and Vine Nutrition

The project site had been dairy farm at one time, but was producing grass hay for 10 years before the establishment of the vineyard. Soil samples were taken at yearly intervals in order to monitor pH and fertility. Lime, nitrogen, potassium, magnesium and boron were soil applied at the beginning of the project. Reductions were made in the application of nitrogen and potassium as the project progressed.

Soil and Vine Nutrition continued...

Bloom time petiole samples were taken from indicator varieties (Auxerrois and Okanagan Riesling) as well as from varieties that exhibited particular foliar symptoms of nutritional deficiency. Spray applications of boron, magnesium, zinc and iron were made annually using recommendations published in the British Columbia Grape Production Guide.

Varieties Planted

The purpose of the project was to evaluate the potential for commercial fresh and wine market grape varieties in a maritime climate using soils with moisture limitations. Thirty-one varieties were planted at the outset.

Duncan Project- Grape Varieties Planted- 1983

ROW NO.	VARIETY	COLOR	USE
1	Pearl of Csaba	White	Wine
2	Ortega	"	"
3	Siegerrebe	Pink	"
4	Schonburger	"	"
5	Vidal 256	White	"
5	Weissburgunder	"	"
6	Ehrenfelser	"	"
7	Muller Thurgau	"	"
8	Madeleine Angevine	"	"
9	Auxerrois	"	"
10	Precoce de Malinger	"	"
11	Madeleine Sylvaner	"	"
12	Kerner	"	"
13	Gutedel Weiss	"	"
14	Aurora	"	"
15	Rayon D'or	White	Wine
16	Chardonnay	"	"
17	Reliance	Pink	Fresh
18	Suffolk Red	"	"
19	Castel 19637	Blue	Wine
20	Venus	"	Fresh
20	Festivee	"	"
21	Okanagan Riesling	White	Wine
22	Cayuga White	"	"
23	New York Muscat	Red	Wine/Juice
24	Interlakken	White	Fresh
25	Seyval Blanc	"	Wine
26	Sovereign Coronation (Sel.361)	Blue	Fresh
27	Simon (Sel. 375 - Sov. Charter)	"	"
28	Sel. 378 (Sov. Jubilee)	White	Wine
28	Sel. 123 (Sov. Tiara)	"	"
29	Sel. 82 (Sov. Ruby)	Pink	Wine/Juice
30	Sel. 65 (Sov. Gold)	White	"
31	Gamay Noir	Blue	"

Changes to the Planting

There was considerable damage to vine buds, canes and trunks after the cold winter of 1985/86. Crown gall *Agrobacterium tumifaciens* was evident in some varieties and provided an opportunity to evaluate treatment of injured vines with Gallex.

Varieties Suffering More Than 50% Primary Bud Damage After 1985/86 Winter

Venus	Schonburger	Precoce de Malinger
Kerner	Siegerrebe	Pearl of Csaba
Muller Thurgau	Vidal 256	Weissburgunder

As well, it became obvious that some varieties were not producing acceptable fruit for the fresh market and were not performing well either horticulturally or in wine assessments. As a result of this and the winter damage of 85/86, the following varieties were removed in the spring of 1987:

Pearl of Csaba	Aurora	Festivee
Schonburger	Chardonnay	Sov. Coronation
Vidal 256	Reliance	Sel. 378, Sov. Jubilee
Weissburgunder	Suffolk Red	Sel. 123, Sov. Tiara
Precoce de Malinger	Venus	Sel. 65, Sov. Gold
Gutedel Weiss	Muller Thurgau	

Varieties Added to the Planting in the Spring of 1987

ROW NO.	VARIETY	COLOR	USE
1	Optima	White	Wine
4	Bacchus	"	"
5	Pinot Gris	"	"
7	Khulman 482-2	"	"
	Totmur	"	"
10	Perle	Pink	Wine
	Ravat 34	Blue	"
13	Seyve Villard 5247	White	"
	Sel. 495	White	Fresh
14	Horizon	"	Wine
15	Auxerrois	"	"
16	Seyve Villard 23512	White	Wine
	Sel. 434	Pink	Fresh
17	Perlette	White	"
18	Fiesta	"	"
20	Century I	Blue/Red	"
	Vineland 65051	Blue	"
21	Ruby Seedless	Pink	"
	Early Muscat	White	Wine
22	Auxerrois	"	"
27	Sel. 16 (Sov. Aurilius)	"	Fresh/Wine
29	Sel. 239	Blue	Wine
30	Pollux	White	"

Further Changes to the Planting

Further changes were made in the Fall of 1989. Varieties removed were:

Madeleine Angevine
Madeleine Sylvaner
Perlette
Fiesta
Century I
Vineland 65051
Ruby Seedless
New York Muscat
Interlakken
Seyval Blanc
Sov. Coronation

These were replaced by Mr. Dennis Zanatta with a selection of varieties including Auxerrois, Ortega, Pinot Gris. Spatburgunder (Pinot Noir), Clone 90, 91, 93, on Rootstocks 5C and S04 were also added to the planting.

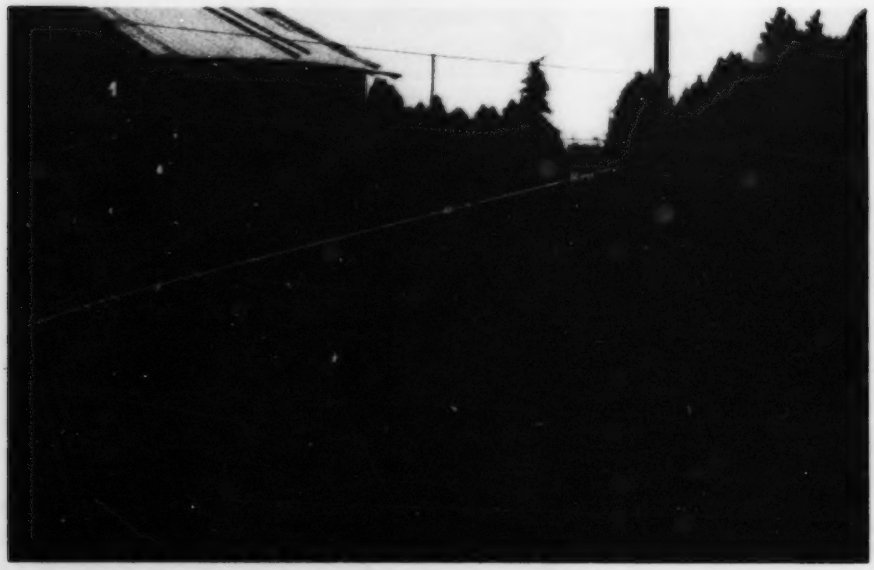
Ministry involvement with the planting was limited in 1988 and 1989 and ended in 1990.

Deer Fencing

Blacktail deer did extensive damage to vines during the growing season while the vineyard was not protected and cottontail rabbits damaged vines during the dormant season.

An electric deer fence consisting of high tensile steel wire under high voltage was installed to protect the planting. This type of vertical fence is not dangerous to domestic animals or injurious to wildlife. It does provide an electric shock when touched, discouraging wildlife from entering the vineyard. The fence discouraged but did not completely prevent deer and rabbits from entering the vineyard. It did eliminate damage to vines by deer and rabbits.

Designs for deer fencing are available from BCMAFF offices.



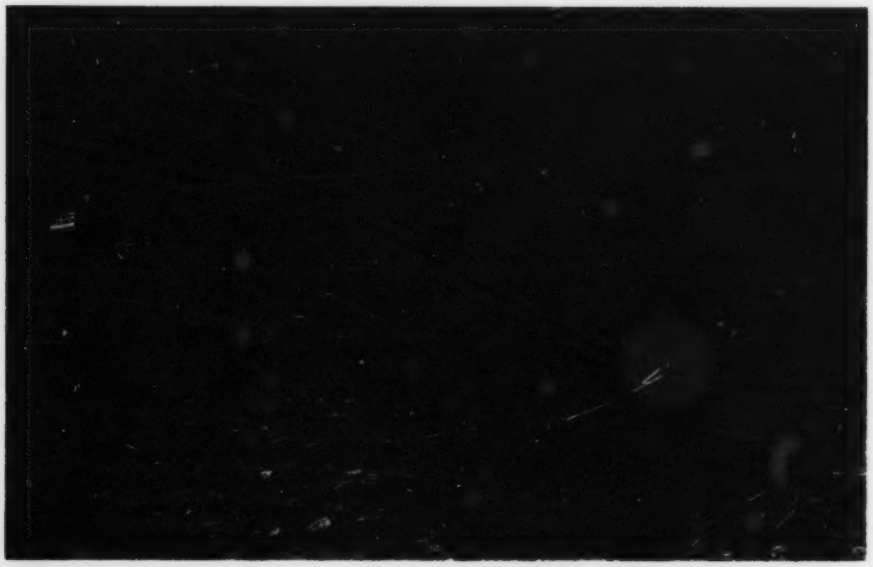
Deer fence with seven wires. Note grounding wires.

Irrigation

Moveable sprinkler lines were used to irrigate the newly planted vines and vineyard in its first season A drip irrigation system was installed prior to the second growing season. Water was pumped from an existing dugout which was supplied with water from an underground aquifer. A one horse-power pump and electric motor limited to approximately 25 gallons per minute floated on a styrofoam raft in the dugout. A simple nylon filter was used to remove debris in the irrigation water. An electric clock controlled the time and duration of irrigation.

The system was designed for evapotranspiration of 0.16 inches per day, using a crop co-efficient of 0.70. Water volume of 18 gpm pumped to a head of 84 feet was required. One gallon per hour orifice emitters were used, spaced at five feet along the row. Emitter operating pressure was 15 psi on average.

The irrigation system operated from May to mid-September on a three-day cycle for three hours.



Two year old vineyard.

Training/Pruning

The general pruning program for the entire vineyard aimed at establishing cordons with spur pruning for wine grapes. Fresh market varieties were cane pruned. An attempt was made in 1986 and 1987 to determine the differences in yields that might occur in a select number of wine varieties pruned to both canes and spurs. Cane pruned varieties were trained to pendelbogen (European Loop) while spur pruned varieties were trained to a cordon. The results from this indicate that all varieties do not respond in the same way. A brief summary table with the results from this trial follows the tables with the phenology and harvest data. The pruning trial showed that yields were higher in four out of seven varieties in favor of cane pruned vines trained to the pendelbogen; two of seven varieties produced higher yields with spur pruning while one of seven varieties showed no difference between the two pruning systems.

Performance of Varieties at the Project Location

Phenology and Harvest Data

VARIETY	Year	Bloom Date	Harvest Date	Average Yield Per Vine (lbs.)	FRUIT ANALYSIS Sugar(%)	pH	Total Acid
AURORA	1985	N/A	Oct. 9	3.8	20.8	3.2	1.20
	1986	June 28	Oct. 13	9.65	17.3	3.13	1.13
Average		**June 28**	**Oct. 11**	**6.73**	**19.05**	**3.17**	**1.17**
AUXERROIS	1985	N/A	Oct. 9	5.98	19.2	3.1	0.9
	1986	June 30	Oct. 27	21.62	15.3	3.14	0.98
	1987	June 29	Sept. 22	13.05	16.8	2.99	0.57
	1988	July 17	Oct. 14	16.7	16.4	2.85	0.9
	1989	June 30	Oct. 9	11.52	18.0	3.26	0.9
Average		**July 5**	**Oct. 10**	**13.77**	**17.14**	**3.07**	**0.85**
BACCHUS	1988	July 9	Oct. 22	1.31	16.7	3.18	0.89
	1989	June 25	Sept. 27	13.9	15.4	3.7	0.8
Average		**July 2**	**Oct. 9**	**7.6**	**16.05**	**3.44**	**0.845**
CASTEL 19637	1985	N/A	Oct. 9	2.98	25.0	3.1	1.1
	1986	June 19	Oct. 28	3.9	24.6	3.2	1.4
	1987	June 17	Oct. 20	9.85	29.1	3.13	1.07
	1988	July 4	Oct. 24	12.04	22.4	2.95	1.47
	1989	June 12	Oct. 13	5.6	21.6	3.2	1.3
Average		**June 30**	**Oct. 18**	**6.87**	**24.54**	**3.12**	**1.27**
CAYUGA WHITE	1985	N/A	Oct. 22	24.66	18.6	3.0	1.1
	1986	June 29	Oct. 14	34.76	17.5	3.0	1.2
	1987	June 29	Oct. 18	61.12	14.8	3.0	0.5
	1988	July 15	Oct. 24	26.47	16.2	2.89	1.08
	1989	June 23	Oct. 13	41.47	15.6	3.05	0.9
Average		**July 12**	**Oct. 18**	**37.70**	**16.54**	**2.99**	**0.96**
CHARDONNAY	1985	N/A	Oct. 22	N/A	19.0	3.2	1.1
	1986	June 28	Oct. 28	0.94	19.2	3.0	1.47
Average		**June 28**	**Oct. 23**	**N/A**	**19.1**	**3.1**	**1.29**
CENTURY 1	1988	July 9	Oct. 14	N/A	16.6	2.97	0.6
	1989	June 25	Oct. 13	N/A	14.2	3.04	0.93
Average		**July 3**	**Oct. 13**	**N/A**	**15.4**	**3.01**	**0.77**
EARLY MUSCAT	1988	July 17	Oct. 12	N/A	19.0	3.47	0.6
	1989	July 3	Sept. 27	28.25	17.0	3.29	0.9
Average		**July 10**	**Oct. 4**	**28.25**	**18.0**	**3.38**	**0.75**

continued . . .

VARIETY	Year	Bloom Date	Harvest Date	Average Yield Per Vine (lbs.)	FRUIT ANALYSIS Sugar(%)	pH	Total Acid
EHRENFELSER	1985	N/A	Oct. 18	5.09	19.0	3.0	1.3
	1986	June 30	Oct. 27	8.42	18.2	2.96	1.21
	1987	June 29	Oct. 16	13.7	20.3	2.87	0.8
	1988	July 9	Oct. 22	16.67	17.4	2.86	1.2
	1989	June 28	Oct. 13	10.00	18.4	3.09	1.23
Average		**July 1**	**Oct. 19**	**10.78**	**18.66**	**2.96**	**1.15**
FESTIVEE	1985	N/A	Oct. 18	2.5	18.4	3.1	1.3
	1986	June 29	Oct. 28	5.96	16.2	2.6	1.47
Average		**June 29**	**Oct. 23**	**4.23**	**17.3**	**2.85**	**1.39**
FIESTA	1988	July 17	Oct. 28	N.A.	16.0	2.9	1.11
	1989	July 1	No Crop				
GAMAY NOIR	1985	N/A	Oct. 12	0.42	21.8	3.0	1.10
	1986	June 30	Oct. 28	8.98	18.8	3.14	1.02
	1987	June 29	Oct. 20	13.3	22.1	3.10	0.94
	1988	July 4	Oct. 23	9.1	16.0	3.0	1.38
	1989	June 29	Oct. 14	17.86	17.8	3.2	1.34
Average		**July 1**	**Oct. 19**	**9.9**	**19.3**	**3.09**	**1.16**
GUTEDEL WEISS	1985	N/A	Oct. 9	4.27	17.0	3.00	1.0
	1986	June 30	Oct. 27	8.43	15.6	3.2	0.82
Average		**June 30**	**Oct. 18**	**6.35**	**16.3**	**3.1**	**0.91**
HORIZON	1988	July 4	N/A	N/A	16.8	3.06	0.75
	1989	June 16	Oct.2	9.8	16.8	3.05	0.84
Average		**June 25**	**Oct. 2**	**9.8**	**16.8**	**3.05**	**0.89**
INTERLAKKEN	1985	N/A	Sept. 27	2.4	19.2	3.0	0.6
	1986	June 29	Oct. 13	19.82	22.0	3.2	0.81
	1987	June 29	Sept. 22	8.96	19.9	3.0	0.76
	1988	July 15	Oct. 7	4.29	19.4	2.9	1.0
	1989	June 25	Oct. 13	12.5	21.4	3.29	0.63
Average		**July 3**	**Oct. 14**	**9.59**	**20.38**	**3.08**	**0.76**
KERNER	1985	N/A	Oct. 22	10.8	20.0	3.1	1.5
	1986	June 29	Oct. 27	6.87	18.8	2.94	1.36
	1987	June 29	Oct. 16	13.5	21.0	2.96	0.07
	1988	July 9	Oct. 17	15.5	14.0	3.09	1.05
	1989	June 28	Oct. 13	10.0	19.4	3.09	1.08
Average		**July 2**	**Oct. 19**	**11.33**	**18.64**	**3.04**	**1.01**

continued . . .

VARIETY	Year	Bloom Date	Harvest Date	Average Yield Per Vine (lbs.)	FRUIT ANALYSIS Sugar(%)	pH	Total Acid
KHULMAN 482-2	1988	July 4	—	—	—	—	—
	1989	—	Sept. 22	9.07	19.0	3.24	0.7
MADELEINE ANGEVINE	1985	N/A	Oct. 9	10.79	19.4	3.0	1.1
	1986	June 30	Oct. 13	24.93	17.2	3.15	0.82
	1987	June 29	Sept. 22	22.35	17.9	2.85	0.67
	1988	July 17	Oct. 3	23.56	16.0	2.99	1.06
	1989	June 30	Oct. 13	13.08	16.4	3.23	1.06
Average		**July 5**	**Oct. 6**	**18.94**	**17.38**	**3.04**	**0.94**
MADELEINE SYLVANER	1985	N/A	Sept. 6	14.27	16.8	3.4	0.7
	1986	June 30	Sept. 30	25.03	14.8	3.69	0.6
	1987	June 29	Sept. 9	12.53	19.0	3.75	0.5
	1988	July 17	Sept. 18	22.04	16.0	3.13	0.81
	1989	June 30	Sept. 26	22.1	20.0	3.2	0.5
Average		**July 5**	**Sept. 18**	**19.19**	**17.32**	**3.43**	**0.62**
MULLER THURGAU	1985	N/A	Oct. 9	3.4	17.6	3.0	1.0
	1986	June 30	Oct. 13	11.64	15.7	2.91	1.0
Average		**June 30**	**Oct. 11**	**7.5**	**16.65**	**2.96**	**1.0**
NEW YORK MUSCAT	1985	N/A	Oct. 9	4.66	20.0	3.1	0.7
	1986	June 30	Oct. 14	13.25	18.6	3.14	0.82
	1987	June 29	Sept. 22	11.4	16.8	3.17	0.34
	1988	July 15	Oct. 14	5.69	15.4	3.21	0.31
	1989	July 4	Sept. 27	9.96	15.8	3.21	0.6
Average		**July 5**	**Oct. 5**	**8.99**	**17.32**	**3.12**	**0.55**
OKANAGAN RIESLING	1985	N/A	Oct. 22	9.6	20.2	2.9	1.3
	1986	June 26	Oct. 27	16.95	19.9	3.02	1.1
	1987	June 17	Oct. 20	19.65	17.7	3.05	0.68
	1988	July 19	Nov. 5	27.5	17.5	2.79	1.20
Average		**July 1**	**Oct. 26**	**18.43**	**18.83**	**2.94**	**1.07**
OPTIMA	1989	June 25	Sept. 22	3.09	17.2	3.1	0.96
ORTEGA	1985	N/A	Sept. 19	4.95	18.6	3.0	1.0
	1986	June 30	Oct. 13	13.0	19.1	3.12	0.82
	1987	June 29	Sept. 22	17.97	20.2	2.83	0.91
	1988	July 9	Oct. 2	11.35	17.2	3.0	0.9
	1989	June 29	Sept. 22	3.09	17.2	3.1	0.96
Average		**July 2**	**Sept. 28**	**10.07**	**18.46**	**3.01**	**0.92**
PEARL OF CSABA	1985	N/A	Sept. 6	N/A	17.2	3.3	0.8
	1986	N/A	very small crop				

continued . . .

VARIETY	Year	Bloom Date	Harvest Date	Average Yield Per Vine (lbs.)	FRUIT ANALYSIS Sugar(%)	pH	Total Acid
PERLE	1988	July 9	Oct. 22	1.58	14.2	3.14	1.18
	1989	July 1	Sept. 27	10.2	16.6	3.04	0.69
Average		**July 5**	**Oct. 9**	**5.89**	**1.54**	**3.09**	**0.94**
PERLETTE	1988	July 17	Oct. 7	N/A	18.4	4.0	1.59
	1989	July 1	Sept. 27	3.2	16.6	3.23	0.6
Average		**July 10**	**Oct. 2**	**N/A**	**17.5**	**3.62**	**1.09**
PINOT GRIS	1988	July 9	Oct. 22	0.9	16.7	3.19	1.05
	1989	June 23	Sept. 27	7.7	17.6	3.2	1.18
Average		**July 1**	**Oct. 9**	**4.3**	**17.15**	**3.2**	**1.12**
POLLUX	1988	July 4	Oct. 14	N/A	15.6	2.8	1.1
	1989	June 16	Oct. 9	13.28	15.2	3.4	1.07
Average		**June 24**	**Oct. 11**	**N/A**	**15.4**	**3.1**	**1.09**
RAVAT 34	1989	N/A	Sept. 18	N/A	16.6	3.05	1.34
RAYON D'OR	1985	N/A	Oct. 22	14.54	20.0	3.0	1.5
	1986	June 28	Oct. 27	14.0	16.7	3.0	1.4
	1987	June 29	Oct. 20	17.97	20.2	2.83	0.91
	1988	July 4	Nov. 1	14.4	18.4	2.9	1.47
Average		**July 1**	**Oct. 25**	**15.23**	**18.83**	**2.93**	**1.32**
RELIANCE	1985	N/A	Oct. 9	4.96	21.0	3.0	0.9
	1986	June 28	Sept. 29	10.9	16.5	3.2	0.76
Average		**June 28**	**Oct. 11**	**7.93**	**18.75**	**3.1**	**0.83**
RUBY SEEDLESS	1988	July 19	Oct. 14	N/A	11.8	2.79	1.2
	1989	N/A	Oct. 13	15.0	12.0	3.2	1.0
Average		**July 19**	**Oct. 13**	**N/A**	**11.9**	**2.99**	**1.1**
SCHONBURGER	1985	N/A	Oct. 9	1.5	21.0	3.2	0.8
	1986	N/A	No crop				
SEL. #82 (SOVEREIGN RUBY)	1985	N/A	Oct. 9	5.3	18.6	3.1	1.0
	1986	June 28	Oct. 14	9.78	18.6	2.91	1.06
	1987	June 29	Sept. 23	30.98	15.3	2.89	0.56
	1988	July 17	Oct. 14	9.77	17.6	2.99	0.6
	1989	July 1	Sept. 22	40.53	18.0	3.72	0.92
Average		**July 4**	**Oct. 4**	**19.27**	**17.6**	**3.12**	**0.83**

continued . . .

VARIETY	Year	Bloom Date	Harvest Date	Average Yield Per Vine (lbs.)	FRUIT ANALYSIS Sugar(%)	pH	Total Acid
SEL.#123	1985	N/A	Oct. 22	3.4	21.0	3.4	0.8
(SOV. TIARA)	1986	June 27	Oct. 14	14.9	20.3	3.0	1.17
Average		**June 27**	**Oct. 18**	**9.15**	**20.65**	**3.2**	**0.99**
SEL. #165	1985	N/A	Oct. 9	1.7	22.6	3.2	0.6
(SOVEREIGN GOLD)	1986	June 30	Oct. 13	11.64	22.2	3.0	0.78
Average		**June 30**	**Oct. 11**	**6.67**	**22.4**	**3.1**	**0.69**
SEL. #378	1985	N/A	Sept. 30	8.53	19.0	3.2	0.9
(SOV. JUBILEE)	1986	June 28	Oct. 9	2.9	19.0	3.1	0.6
Average		**June 28**	**Oct. 4**	**5.72**	**19.0**	**3.15**	**0.75**
SEYVAL BLANC	1985	N/A	Oct. 22	23.9	20.0	3.0	1.3
	1986	June 30	Oct. 27	14.46	16.4	2.96	1.28
	1987	June 29	Oct. 17	35.87	17.6	2.81	0.86
	1988	July 15	Oct. 23	26.12	16.6	2.88	1.06
	1989	June 16	Oct. 13	30.77	15.1	2.86	1.34
Average		**July 1**	**Oct. 20**	**26.22**	**17.14**	**2.90**	**1.17**
SEYVE VILLARD SEL. #5247	1989	June 16	Oct. 8	6.38	17.2	3.26	1.07
SEYVE VILLARD	1988	July 17	Oct. 14	—	13.6	2.7	1.4
SEL. #23512	1989		Nov. 1	4.6	15.6	3.05	1.2
SIEGERREBE	1985	N/A	Sept. 19	4.72	16.4	3.3	0.7
	1986	June 30	Sept. 21	10.49	16.2	3.77	0.49
	1987	June 29	Sept. 9	10.11	15.9	3.2	0.55
	1988	July 9	Sept. 17	6.4	16.2	3.4	0.8
	1989	June 29	Sept. 14	7.0	20.5	3.6	0.7
Average		**July 2**	**Sept. 16**	**7.74**	**17.04**	**3.45**	**0.65**
SIMONE	1985	N/A	Oct. 9	14.0	17.0	3.1	0.7
(SOV. CHARTER)	1986	June 28	Oct. 13	28.17	19.2	3.0	0.6
SEL. #375	1987	June 17	Sept. 22	45.79	16.5	2.9	0.45
	1988	July 14	Oct. 14	16.59	16.2	2.95	0.57
	1989	June 16	Sept. 27	57.8	14.2	3.07	0.69
Average		**June 26**	**Oct. 5**	**32.47**	**16.62**	**3.00**	**0.60**
SOVEREIGN	1988	July 4	Oct. 14	N/A	18.0	3.23	0.69
AURILIUS	1989	June 16	Oct. 13	14.7	15.4	3.04	0.93
Average		**June 25**	**Oct. 13**	**N/A**	**16.7**	**3.05**	**0.79**

continued . . .

VARIETY	Year	Bloom Date	Harvest Date	Average Yield Per Vine (lbs.)	FRUIT ANALYSIS Sugar(%)	pH	Total Acid
SOV. CORONATION	1985	N/A	Sept. 27	3.99	19.3	2.9	0.6
SEL. #361	1986	June 30	Oct. 13	6.37	21.2	3.0	0.69
Average		**June 30**	**Oct. 5**	**5.18**	**20.25**	**2.95**	**0.65**
SUFFOLK RED	1985	N/A	Oct. 9	2.34	19.0	2.9	1.1
	1986	June 29	Sept. 29	3.6	16.6	3.0	0.97
Average		**June 29**	**Oct. 4**	**2.97**	**17.8**	**2.95**	**0.65**
SUMMERLAND SEL. #239	1989	June 12	Sept. 22	6.7	18.0	3.22	0.99
SUMMERLAND	1988	July 17	Crop too small to measure				
SEL. #434	1989	July 1	Crop too small to measure				
SUMMERLAND	1988	N/A	Crop too small to measure				
SEL. #495	1989	N/A	Sept. 27	6.18	16.6	3.02	0.78
TOTMUR	1989	June 12	Sept. 27	3.64	24.4	3.08	1.15
VENUS	1985	N/A	Oct. 18	5.66	20.0	3.1	1.3
	1986	June 29	Oct. 27	10.43	15.4	3.1	0.66
Average		**June 29**	**Oct. 22**	**8.05**	**17.7**	**3.1**	**0.98**
VIDAL 256	1985	N/A	Oct. 22	13.5	18.8	3.0	1.8
	1986	July 4	Oct. 27	17.41	16.3	2.9	1.55
Average		**July 4**	**Oct. 24'**	**15.46**	**17.55**	**2.95**	**1.68**
VINELAND 65051	1988	July 9	Oct. 14	N/A	15.7	2.95	0.84
	1989	June 12	Oct. 13	14.70	15.4	3.04	0.93
Average		**June 25**	**Oct. 13**	**N/A**	**15.6**	**2.99**	**0.89**
WEISSBURGUNDER (Pinot Blanc)	1985	N/A	Oct. 22	3.5	21.8	3.2	1.1
	1986	July 4	Oct. 27	6.0			
Average		**July 4**	**Oct. 24**	**4.75**			

The Duncan Project - Pruning Trial

Variety/ Pruning System	No. Vines	Total Wt/Vine	(lbs.) Wt/Vine	No. Clusters	(lbs.) Wt/Clusters	Tons/Acre @ 806
AUXERROIS						
- Pendelbow	10	210.52	18.92	681.5	0.309	7.62
- Spur	11	157.7	14.5	588	0.268	5.84
EHRENFELSER						
- Pendelbow	6	52.36	9.66	N/A	N/A	3.89
- Spur	7	92.38	12.18	N/A	N/A	4.91
KERNER						
- Pendelbow	14	215.03	15.44	N/A	N/A	6.22
- Spur	10	137.68	14.60	N/A	N/A	5.88
MADELEINE ANGEVINE						
- Pendelbow	10	239.1	23.68	848	0.282	9.54
- Spur	9	221.8	23.94	736	0.301	9.65
MADELEINE SYLVANER						
- Pendelbow	15	326.36	19.41	821	0.398	7.82
- Spur	12	193.0	17.15	490	0.394	6.91
ORTEGA						
- Pendelbow	9	124.7	14.24	436	0.286	5.74
- Spur	10	122.8	11.98	482	0.255	4.83
RAYON D'OR						
- Pendelbow	16	219.66	14.05	645	0.34	5.66
- Spur	10	201.21	20.04	559	0.359	8.076

The 1985 and 1986 harvests were put through a hand operated de-stemmer which partly crushed the fruit. The crushed fruit was collected in 20 liter food grade polyethylene pails, treated with metabisulfite plus gelatin, and sealed with a tight fitting lid. Transportation to the Agriculture Canada Research Station at Summerland was by truck, and took anywhere from one to three days.

The 1987 and 1988 crops were put through the same hand operated de-stemmer. The partly crushed fruit was then put into a cheese cloth bag inside a small basket press. Juice was collected in 20 liter food grade polyethylene pails, treated with metabisulfite and gelatin, and sealed with a tight fitting lid. The juice was then treated the same way as the 1985 and 1986 harvests. Once at the Research Station, the crushed fruit and/or juice was placed in cold storage for a short period of time until the wine maker was able to handle the harvest. Normally, delivery of the pails occurred in late afternoon and pressing or handling of juice occurred the next morning.

The choice of vintering procedure was established through close cooperation between vintners, producers, provincial government extension personnel and federal researchers. Vintering was conducted in the simplest manner possible consistent with the objective assessment of the unique character of each variety. By commercial standards, many of the wines which were produced would not be acceptable since no adjustments were made and wines were finished to dryness. However, it was inherent in the wine evaluations that a skilled wine maker could objectively assess the wine that was produced and could assess the varietal flavors and, knowing how the wine was made, could identify the production techniques that would be used to produce the wine style desired by the winery.

White must was brought to room temperature, treated with 75 ppm sulfite and pressed by rack and cloth press. The juice was racked after 24 hours of setting and inoculated with *Saccharomyces cervisae* (Champagne Epernay) yeast. Fermentations were conducted in glass carboys. For the first 48 hours after inoculation the fermentation room was held at 22^{o}C. The room temperature was reduced to 12 to 14^{o}C when the first uniform layer of bubbles formed on the wine surface. Wines were fermented to dryness. Room temperature was raised to 20^{o}C near the end of fermentation, wines were racked, treated with 100 ppm

Site at the Duncan project where grapes are crushed.

sulfite and stored at 0°C to encourage tartrate precipitation. At the end of chill proofing, the wines were racked, coarse filtered, membrane filtered and bottled under cork. Wines were not adjusted for acidity.

Red must was warmed to room temperature and treated with 75 ppm sulfite. After 24 hours red must was inoculated with *Saccharomyces cerevisae*(Y5) yeast. Primary fermentation was carried out in the presence of skins, pulp and seeds in food grade 20 liter polyethylene pails with tight fitting lids and fermentation locks. Fermentations were held at 20 to 22°C to assist color extraction. When color extraction reached an appropriate level, the must was pressed in a rack and cloth press and fermentations were completed in glass carboys. The red wines were thereafter treated in the same way as white wines.

Basket press and 20 litre food grade polyethylene pail.

Basket press and 20 litre food grade polyethylene pail.

Wine Assessment

The wines were assessed at Duncan by a group of 20 to 25 invited guests as well as at the Research Station by five or six experienced wine tasters. All wines were scored without being identified to the panelists. Discussion followed the tasting. Panelists identified the varieties that were felt to have commercial potential. A composite listing of varieties with commercial potential was developed from comments provided by both groups of tasters and is given below:

Variety	Comments (Description)
Auxerrois	Fruity, caramel, honey, herbaceous
Bacchus	Pleasant muscat, fruity, more intense flavor than Auxerrois.
Castel 19637	Red, intense color, full body, attractive, earthy flavor. Hybrid character. Acidity.

Variety	Comments (Description)
Cayuga White	Slight muscat, delicate fruitiness. Well suited to sparkling wine production.
Ehrenfelser	Delicate muscat, fruity, heavy, intense
Gamay Noir	Red. Light, fruit, high acidity
Gutedel Weiss flavor	Weak color and taste, fruity, vegetative, green bean
Interlakken	Slight labrusca, slight muscat, delicate, Riesling-like.
Kerner	Light, fruity, floral, minty, astringent
Madeleine Angevine	Delicate fruitiness, pleasant, Riesling-like
Madeleine Sylvaner	Low intensity, fruity (with skin fermentation); neutral (no skin fermentation).
Muller Thurgau	Desirable muscat, moderate body, delicate, Riesling-like.
New York Muscat	Very fruity, between labrusca and muscat, full body flavor
Ortega	Delicate fruit, green pepper, slight muscat
Pinot Gris	Spicy, earthy, full bodied
Siegerrebe	Rich, fruity, muscat, good balance, intense. Useful in blends because of low acid and fruitiness. Pink to rose.
Sel. 82 (Sov. Ruby)	Slightly fruity, pleasant flavor, muscat. Pink to rose.

Conclusion

Assessing the suitability of a region for prodution of commercial quantities of desirable wine or fresh market grapes normally requires 20 to 30 years. Even at the end of such a time period, there would be many questions regarding variety selection, cropping levels, training systems to use, and wine styles possible.

The Duncan Project was not long enough or funded at a level which would permit the assessment of wines produced from mature vines.

In the short period of time allocated to this project enough information was gathered to make only the following comments:

1. The coarse textured, rapidly draining Qualicum soils are suitable for grape production when irrigation is used to supplement natural rainfall and fertility is improved through the use of lime and soil nutrients.

   Irrigation during the establishment period reduces the time needed to bring the vineyard into production. Irrigation may not be required after vines are established on soils with a finer texture.

   Reconnaissance and detailed soil survey reports and maps for the project area as well as for portions of Vancouver Island and the Fraser Valley are available from Maps B.C.

   Other soil groups on Vancouver Island besides the Qualicum soils suitable for grape production (but not necessarily limited to these) would include Dougan, Deerholm, Flewett, Hillbank, Maple Bay, Cassidy, Hollings, Quesnel, Mexicana and Beddis. Drainage may be required for some soil types such as Mexicana and others that are not mentioned. Soil groups that fit the physical characteristics required for grapes in the Fraser Valley would include Bose, Watcom, Nicholson, Ryder, Lonzo Creek, Monroe, Linden. The Agriculture Soil Management groups to consider in the Fraser Valley would include the Abbotsford, Bose, Columbia, Fairfield, Watcom, Monroe, Ryder and Sunshine groups. Maps are available to accompany the Fraser Valley Soil Management Handbook and indicate the location of Agriculture Soil Management Groups. Both are available from: Maps B.C., Ministry of Lands and Parks, Surveys and Resources Mapping Branch, 4th Floor, 1802 Douglas St., Victoria, B.C. V8V 1X4.

2. Climate data collected at the project site suggest that the climate for the area is comparable to other cool climate grape growing regions of the world.

   Selection of other sites in the coastal regions must be warm south or west facing, preferably on slopes. Such sites should have soils that are well drained. Climate data such as heat units will fluctuate from year to year, making it possible to have years with low heat unit accumulations, and therefore late ripening and late harvests of mature or immature fruit, depending on varieties chosen. Local variations in climate conditions do occur and are generally best known to experienced local people. These people should be asked for comments on local fog, frost, rain and heat "pockets". Excellent site selection (climate and soils) will be absolutely critical to successful viticulture/winery enterprise in the maritime climates.

   There are no climate reports or maps similar in detail to the soil survey reports and soil maps, making site selection on the basis of climate and soils very difficult. A selected list of large scale climate maps is available from Maps B.C. These maps are not detailed enough, and should only be used as a general reference.

   Collection and detailed mapping of the climate resources in the coastal areas would greatly facilitate extrapolation of climate, soil and grape variety performance data to other potential vineyard sites.

3. Protection from wildlife such as deer, rabbits and birds must be considered if grapes are planted for commercial purposes.

4. The effects of the 1985/86 winter demonstrated that even in cool maritime climates it is necessary to have well matured vines before the onset of winter. Climate conditions tend to encourage slow wood maturity and late fruit ripening, making vines vulnerable to low winter temperatures in the region.

5. Treatment of one half of the crown gall infected vines with Gallex produced results that were inconclusive.

6. Trellising should encourage use of the vine's vigor and exposure of the fruit. Vines appear to be more vigorous under the cooler maritime conditions than they are under the warmer climate of the Okanagan, for example. Careful management of the irrigation water applied, plus careful use of nitrogen fertilizer will be required. In addition, use of split or divided canopies and other aids to increased fruit exposure (eg. leaf removal, if needed) should be considered.

7. Cane pruning appears to be a first choice in pruning systems for several reasons. Until the fruiting habit of a particular variety is well understood, it appears that cane pruning will produce acceptable yields. Spur pruning in this project led to concentrations of fruit in one area, making disease control more difficult.

8. Crop loads in this project varied widely, making it difficult to assess the effects of of crop load on fruit quality and wine quality. Generally speaking, high fruit loads reduced fruit quality and reduced wine quality. Moderate crop loads produced by 20 buds per vine tended to produce adequate yields and good wine quality.

9. Fruit handling methods for wine production were the best that could be obtained, but undoubtedly reduced the final wine quality.

10. The "bottom line" for this project lies in the quality of the wines. Assess- ment of wine quality for this project was difficult due to the many variables in fruit and must handling procedures, changing wine panels and changing scoring systems used. The most representative way of expressing the wine quality is through the use of the descriptors used by the various wine tasters.

    These descriptors and comments provided suggest that the production of good quality wines in good sites in the maritime climate of British Columbia is possible.

11. The wine varieties used in this project represent only those available at the time this project was initiated, and not the entire spectrum of varieties possible. Projects of this nature do not have resources that would permit the assessment of the commercial potential of newer varieties introduced or made available at a later date. However, based on the results of this project, continued evaluation of new potentially suitable varieties for coastal areas appears justified. The best of varieties grown in parts of other countries with cool climate conditions (eg. parts of the Puget Sound, parts of Nova Scotia, England, parts of France, parts of Switzerland, parts of Luxembourg and parts of New Zealand) are similar to those varieties in the Duncan project that appear to have promise. New variety introductions from some of these other cool climate areas will undoubtedly also be suitable for British Columbia.

Regardless of the number of varieties that may be available, choices must be based on the length of growing season required by the variety to produce economical crops of well matured fruit. The wines and wine styles that will develop in the cool climate Appellation regions of British Columbia will reflect the vine's character and the ability of both the vine and the wine maker to achieve varietal character and maturity typical of cool climates.

12. The fresh market varieties used in this project are not generally suitable for commercial production in the coastal area. Two varieties, Interlakken and Simone, appeared promising at times but cluster size, yield and berry size varied from year to year. Interlakken, a seedless green grape, produced the largest berries and clusters when vines were girdled or sprayed with Giberilic Acid (not a registered growth regulator in Canada). Simone, a seedless, blue concord type, also responded well to Giberilic acid sprays.

Harvest time in Duncan.